THE

ONTARIO WATER RESOURCES

COMMISSION

REPORT ON

POLLUTION ABATEMENT

Water pollution survey

IN THE

OTTAWA RIVER

AT THE

TOWN OF HAWKESBURY

COUNTY OF PRESCOTT

1964

REPORT ON

POLLUTION ABATEMENT

IN THE

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AT THE

TOWN OF HAWKESBURY

COUNTY OF PRESCOTT

Prepared by: R. Manson, P. Eng.

April 27, 1964 -
May 8, 1964

THE DIVISION OF SANITARY ENGINEERING

INTRODUCTION

An investigation of the Ottawa River at Hawkesbury was conducted on the above dates to study possible methods of pollution abatement. Officials of the Town of Hawkesbury and Canadian International Paper Company Limited were contacted and provided assistance to the writer during the course of the investigation.

On August 22, 1963, an investigation of the Ottawa River at Hawkesbury revealed gross pollution due to the discharge of partially treated industrial wastes from the Canadian International Paper Company Ltd. (C.I.P.) lagoon and raw sewage from the Town of Hawkesbury.

SAMPLING PROCEDURE

Samples of surface water were collected from the Ottawa River on May 7, along the south shore with the majority being collected in the bay downstream of the Perley Interprovincial Bridge, and were subsequently submitted to the OWRC laboratory in Toronto for bacteriological examination and chemical analysis. The locations of the sampling points are shown on the appended map.

SAMPLE RESULTS

A copy of the laboratory results pertaining to the samples collected (Table I) and an interpretation of the various analyses employed to assess the quality of the surface

INTRODUCTION

An investigation of the Ottawa River at Hawkesbury was conducted on the above dates to check possible sources of pollution upstream. Officials of the Town of Hawkesbury and Canadian International Paper Company Limited were contacted and provided assistance to the writer during the course of the investigation.

On August 23, 1961, an investigation of the Ottawa River at Hawkesbury revealed gross pollution due to the discharge of [illegible] and industrial wastes from the Canadian International Paper Company Ltd. (C.I.P.) Limited and raw sewage from the Town of Hawkesbury.

SAMPLING PROCEDURE

Samples of surface water were collected from the Ottawa River on Map 1, along the south shore with the majority being collected at the top downstream of the Perley Inter-provincial Bridge, and were subsequently submitted to the OWRC laboratory in Toronto for bacteriological examination and chemical analysis. The locations of the sampling points are shown on the appended map.

SAMPLE ANALYSES

A copy of the laboratory analyses pertaining to the samples collected (Table I) and an interpretation of the [illegible] analytical results as to the quality of the [illegible]

water are appended.

The laboratory results confirm the gross pollution of the Ottawa River revealed in the previous investigation. Pollution is evidenced by the high BOD and coliform content which exceed the surface water quality objectives of 4.0 ppm BOD and 2,400 coliforms per 100 ml (membrane filter technique). The results show high BOD's downstream of the C.I.P. lagoon outlet and in the vicinity of the town sanitary outfall sewer. The high coliform counts at sampling point No's 10, 11, 15, and 16 are attributed to the discharge of raw sewage from Hawkesbury to the Ottawa River. Another indication of pollution is a comparison of the laboratory results pertaining to the samples collected at sampling point No's 1, 4, 7, and 14 with the remaining results. The samples collected at these points do not contain contaminants from the town or the C.I.P. lagoon.

FIELD OBSERVATIONS

Float Studies

From May 5 to 7, float studies were conducted to determine the direction of currents in the vicinity of the C.I.P. lagoon and in the bay into which the municipal sanitary outfall sewer extends. Each float consisted of two sealed cylinders. The larger cylinder was suspended from the smaller cylinder at an approximate depth of four feet

and was equipped with vanes for stabilization. The smaller cylinder floated on the surface and served as a marker only. Adjustments in the depth at which the larger cylinder moved were made at times if shallow areas were encountered.

Floats were placed opposite the C.I.P. outfall sewer at distances of 100, 200, 350, and 500 feet from the end of the sewer. The two floats nearest to the sewer passed under the first and second bridges approaching the Perley Bridge and then into the bay. The two remaining floats turned northward as they approached John Street, and passed through the two breaches in the abandoned mill dam. The floats were then caught in the main current of the Ottawa River, and moved directly downstream passing the shoreline at the municipal sanitary outfall sewer at an approximate distance of 1000 feet.

Floats were also placed in the water at sampling point No's 10, midway between 10 and 11, 11, 12, and 13. They moved downstream generally parallel to the main current, with the floats placed at sampling point No. 11, and other points closer to shore turning northward as they approached the east end of the bay. Another float which was placed between sampling point No. 10 and the shore showed the existence of a small back-current for it moved upstream, then in a semi-circle and headed toward the east end of the bay.

jet was employed which leant for adaptability. The earlier outboard floated on the surface and served as a marker only. Adjustment in the depth at which the lower cylinder moved were made by lines of plastic cord were predetermined.

Floats were placed opposite the C & F. central pumps at distances of 100, 200, 300, and 500 feet from the end of the sewer. The two floats released in the sewer outfall moved into the first and second outlets approaching the Harbor Bridge and then back to bay. The two remaining floats moved northward as they approached John Street, and passed through the two breaches in the abandoned mill dam. The floats were then caught in the main current of the Octone River, and moved directly downstream passing the south side of the municipal sanitary outfall sewer at an approximate distance of 1000 feet.

Floats were also placed in the water at sampling point No. 10, midway between 10 and 11, 12, 13, and 15. They moved downstream generally parallel to the main current, with the floats placed at sampling point No. 11, and other points tending to move together northward as they approached the west end of the bay. Another float which was placed between sampling point No. 10 and the shore showed the existence of a small back-current, for it moved upstream, then in a semicircle and headed toward the east end of the bay.

A diagram showing the results of the float studies is appended to the report.

Velocity Studies

On May 8, flow velocities were determined at various locations in the Ottawa River opposite the C.I.P. lagoon outlet and the municipal sanitary outfall sewer. There was no wind when determining flow velocities at the latter location; however, there was an appreciable west wind at the former location. Flow velocities were obtained using a Gurley current meter.

The results of the studies are as follows:

(1) Opposite C.I.P. Outlet

Location	Depth (in feet)	Velocity (fps) at 0.2 depth	Velocity (fps) at 0.8 depth	Velocity (fps) Average
200 ft. from outlet	9' -2"	1.20	0.66	0.93
350 ft. from outlet	17' -9"	1.52	1.02	1.27
500 ft. from outlet	14' -6"	1.09	0.73	0.91

(2) Opposite Municipal Sanitary Sewer

Location	Depth (in feet)	Velocity (fps) at 0.2 depth	Velocity (fps) at 0.8 depth	Velocity (fps) Average
Sampling Pt. #10	5' -0"	0.08	0.08	0.08
Sampling Pt. #11	7' -10"	0.99	0.70	0.85
Sampling Pt. #12	15' -0"	0.33	0.25	0.29
Sampling Pt. #13	12' -10"	0.59	0.40	0.50
Sampling Pt. #14	24' -10"	1.56	0.88	1.22
Sampling Pt. #14 plus 200 feet	34' -9"	2.19	1.24	1.72

The comparatively high velocity at sampling point No. 11 is attributed to the influence of flows originating at the approach bridges at John Street.

POLLUTION ABATEMENT MEASURES BY MUNICIPALITY

Sewage Treatment Plant

In the previous report, it was recommended that: "The Town of Hawkesbury should proceed with the construction of a primary sewage treatment plant as soon as possible." The need for this sewage treatment plant is demonstrated by the laboratory results pertaining to the samples collected at this time.

Secondary sewage treatment facilities may be provided at a cost of $520,000 based on available information of actual construction costs of such facilities.

Sanitary Outfall Sewer Extension

In the previous report, the second recommendation was: "The present outfall sewer should be extended at least as far as the shoreline which existed prior to the construction of the Carillon dam so that municipal wastes will discharge into the main stream of the Ottawa River."

Among the factors to be considered for the location of an outfall sewer are flow velocities in the river, current patterns at the point of discharge, and downstream effects.

Flow Velocities: In a natural channel without undue obstruction, the critical velocity at which sludge deposits from organic settleable matter or agglomerations of biological floc occur is about 0.6 feet per second as a mean for the

channel cross-section. A velocity of one to two feet per second is required to scour compacted deposits. Thus, in order to prevent the formation of sludge deposits in the Ottawa River, a flow velocity of 0.6 feet per second or greater is required.

With reference to the previously existing shoreline as shown on the map it appears that the outfall sewer should be extended into the main channel, or approximately 500 feet, in order to prevent sludge deposits.

Current Patterns: Only between the shore and sampling point No. 10 was there a small back-current.

Flow Data: During the time that the studies were conducted, the flows in the Ottawa River at the Carillon Dam (according to information received from Quebec Hydro) were as follows:

Date	Flow (cfs)
May 4, 1964	101,000
May 5, 1964	103,000
May 6, 1964	104,000
May 7, 1964	88,000
May 8, 1964	88,000
May 9, 1964	87,000

The average water elevation during the above period was 135.5 feet above mean sea level.

Data pertaining to the flows in the Ottawa River from October, 1950, to July, 1960, are given in Table II.

The yearly mean daily discharge from October, 1950, to September, 1959, varied from 61,700 cfs to 86,100 cfs. Other flow data obtained from the Federal Department of Northern Affairs and National Resources, Water Resources Branch, for the period 1930 to 1960, are noted as follows:

Mean daily discharge	=	68,600 cfs
Maximum daily discharge	=	326,000 cfs on April 17, 1951
Minimum daily discharge	=	24,000 cfs on March 5, 1934

This information indicates that the investigations at this time were conducted during a period of high flows. The flows were approximately 20 per cent in excess of the yearly mean daily discharge (68,600 cfs). This should be considered in the selection of the point of discharge for possible extension of the outfall sewer.

POLLUTION ABATEMENT MEASURES BY CANADIAN INTERNATIONAL PAPER COMPANY LIMITED

The OWRC report of August 22, 1963, recommended that the following action be taken to abate pollution: "The effluent from the Canadian International Paper Company Limited lagoon should be directed so that it enters the main stream of the Ottawa River at a point above the Perley Bridge rather than allowed to flow into the bay east of the bridge."

One possible measure to effect this is discussed herein.

Extension of Outfall Sewer

If the lagoon outfall sewer was extended across Hamilton Island pollution in the bay by C.I.P. wastes would be greatly reduced. Such an extension would be costly.

Reportedly, the company has proposed to extend the existing outfall sewer approximately 480 feet into the channel between the lagoon and Hamilton Island. Studies conducted by company personnel during early 1964 revealed that wastes discharging from the proposed outlet would flow along the southern shore of Hamilton Island, through the abandoned dam, and into the main stream of the Ottawa River above the Perley Bridge. At present, the lagoon effluent discharges into the water along the south side of the channel, flows close to the shore, and under the approach bridges on John Street.

In view of the volume and the strength of the wastes from the lagoon and the possibilities of shore and bottom deposits occurring, the lagoon effluent pipe should ultimately be extended into the main channel in order to receive the effects of maximum dilution.

SUMMARY AND CONCLUSIONS

An investigation of the Ottawa River at Hawkesbury was made on April 22 to May 8, 1964 to study possible measures for pollution abatement.

Samples collected at this time confirmed the existence of pollution which is attributed mainly to the discharge of raw sewage from the Town of Hawkesbury and industrial wastes from the Canadian International Paper Company lagoon to the Ottawa River. The samples results also show the need for the construction of the municipal sewage treatment plant and the need to direct the wastes from the C.I.P. lagoon to the main stream of the Ottawa River upstream of the Perley Bridge instead of allowing the industrial waste to be carried into the bay into which the sanitary sewage discharges.

Velocity and current studies were conducted in the channel between the south shore and Hamilton Island and in the bay east of the Perley Bridge.

The current patterns and flow velocities indicated that the present sanitary outfall sewer should be extended at least 500 feet to prevent the development of objectionable conditions (i.e. sludge banks or sewage being carried to the shore) in the bay.

Reportedly, the Canadian International Paper Company Limited proposes to extend the lagoon outfall sewer for a distance of approximately 480 feet into the channel between the lagoon and Hamilton Island. Studies conducted by C.I.P. and OWRC staff indicated that wastes discharged at the

proposed outlet would be carried, not into the bay, but to the main stream of the Ottawa River upstream of the Perley Bridge. Provided that the lagoon is operated properly, performs satisfactorily, and that no solids deposit in the channel or on the shore, the proposal has merit and, if carried out, may alleviate pollution of the Ottawa River at Hawkesbury. The ultimate solution appears to be an extension of the lagoon effluent pipe into the main channel.

RECOMMENDATIONS

1. With due consideration to critical velocity and current, the Town of Hawkesbury outfall sewer should be extended a minimum of 500 feet into the main channel.

2. Consideration should be given to extend the effluent pipe from the C.I.P. lagoon into the main channel beyond Hamilton Island in order to obtain the effects of maximum dilution.

All of which is respectfully submitted,

District Engineer: ____________________
J. K. Theil

Approved by: ____________________
K. H. Sharpe, Director

/pw

TABLE I

RIVER SURVEY

Ottawa River May 7, 1964 R. Manson

Sample Point No.	Lab. No.	5-Day B.O.D.	Solids Total	Solids Susp.	Solids Diss.	Phenols in ppb	Apparent Colour Units	Lignins as Tannic Acid	Bacteriological Laboratory Lab. No.	Bacteriological Laboratory M.F. Coliform Count per 100 ml.
1	R-615	1.1	84	9	75	10	40	2.5	S-5439	50
2	-616	290	1452	272	1180	0	1100	250	-5440	0
3	-617	46	242	45	197	25	165	25	-5441	100,000
4	-618	0.9	86	10	76	5	40	0.5	-5442	52
5	-619	10	134	20	114	70	80	5.0	-5443	1,010
6	-620	1.7	94	15	79	18	50	2.5	-5444	132
7	-621	0.8	88	10	78	10	40	1.0	-5445	60
8	-630	30	186	27	159	120	140	25	-5454	4,800
9	-631	9.4	122	15	107	60	75	7.5	-5455	4,200
10	-622	30	180	16	164	120	140	25	-5446	120,000
11	-623	18	178	27	151	100	130	20	-5447	115,000
12	-624	4	96	12	84	35	65	5.0	-5448	3,500
13	-625	0.9	78	10	68	10	45	1.0	-5449	200
14	-626	0.8	94	9	85	7	55	1.0	-5450	40
15	-627	26	176	16	160	95	135	25	-5451	77,000
16	-628	21	162	19	143	100	130	20	-5452	89,000
17	-629	1.8	88	11	77	20	45	2.5	-5453	250
18	-632	22	172	14	158	120	135	20	-5436	4,300
19	-633	17	124	17	107	120	115	15	broken in transit	

1. 20' north of west end of CIP log boom - upstream of lagoon outlet
2. 100' from CIP lagoon outlet
3. First approach on John Street to Perley Bridge
4. Main stream of river opposite old dam - upstream of Perley Bridge

See map for sampling point locations

TABLE II

OTTAWA RIVER

DAILY DISCHARGE AT GRENVILLE
(in cubic feet per second)

1950-51

MONTH	DAILY DISCHARGE MEAN	MAXIMUM	MINIMUM
October	41,000	47,500	32,600
November	53,700	69,200	41,400
December	60,500	69,000	49,300
January	58,600	73,800	45,300
February	57,300	63,500	49,700
March	79,400	138,000	58,400
April	224,000	287,000	159,000
May	129,000	230,000	61,300
June	61,200	71,700	50,800
July	66,000	79,100	49,500
August	45,900	51,000	38,900
September	47,200	53,800	36,600
Year	76,900	287,000	32,600

TABLE II (Cont'd)

1951-52

MONTH	DAILY DISCHARGE MEAN	MAXIMUM	MINIMUM
October	67,800	112,000	41,900
November	110,000	123,000	88,400
December	90,900	104,000	75,500
January	76,500	87,600	67,300
February	71,800	85,500	59,000
March	71,100	87,100	57,500
April	142,000	168,000	97,600
May	136,000	187,000	81,100
June	96,000	151,000	56,500
July	60,300	78,700	43,200
August	61,700	88,200	40,400
September	48,700	53,300	41,300
Year	86,100	187,000	40,400

TABLE II (Cont'd)

1952-53

MONTH	DAILY DISCHARGE MEAN	MAXIMUM	MINIMUM
October	50,300	57,800	41,000
November	46,900	58,400	38,600
December	63,700	88,800	44,300
January	62,400	73,500	49,500
February	66,300	74,100	58,600
March	96,100	191,000	58,000
April	151,000	189,000	114,000
May	86,000	114,000	57,200
June	51,400	59,400	41,100
July	42,600	48,400	36,500
August	36,800	42,900	31,100
September	33,200	36,900	27,400
Year	65,500	191,000	27,400

TABLE II (Cont'd)

1953-54

MONTH	DAILY DISCHARGE MEAN	MAXIMUM	MINIMUM
October	36,400	40,400	30,300
November	35,500	39,800	29,400
December	37,900	50,000	31,400
January	39,600	46,200	33,300
February	42,100	47,800	34,700
March	64,900	77,900	41,900
April	134,000	182,000	64,400
May	95,200	116,400	61,100
June	92,100	115,600	65,300
July	63,400	79,200	50,000
August	47,400	52,100	41,300
September	50,800	69,200	40,100
Year	61,700	182,000	29,400

TABLE II (Cont'd)

1954-55

MONTH	DAILY DISCHARGE MEAN	MAXIMUM	MINIMUM
October	95,200	118,700	74,500
November	94,500	121,900	74,600
December	81,600	103,600	68,800
January	73,700	83,300	62,300
February	64,200	69,200	56,500
March	68,800	80,600	56,100
April	167,000	216,000	83,200
May	84,900	143,000	58,100
June	51,000	65,600	40,400
July	39,300	44,400	33,000
August	31,300	34,400	26,300
September	31,600	34,800	24,500
Year	73,500	216,000	24,500

TABLE II (Cont'd)

1955-56

MONTH	MEAN	MAXIMUM	MINIMUM
	DAILY DISCHARGE		
October	39,500	59,400	27,200
November	72,600	90,000	59,000
December	69,500	67,000	50,600
January	51,800	63,800	42,400
February	48,300	51,900	41,700
March	46,700	59,700	40,400
April	102,000	146,000	38,700
May	111,000	123,000	96,200
June	87,400	123,000	57,600
July	62,800	76,700	50,000
August	57,700	75,800	44,700
September	73,000	80,800	64,400
Year	67,600	146,000	27,200

TABLE II (Cont'd)

1956-57

MONTH	DAILY DISCHARGE MEAN	MAXIMUM	MINIMUM
October	77,500	97,300	62,000
November	59,600	70,300	52,000
December	59,200	68,400	48,200
January	61,200	80,800	43,400
February	58,300	62,300	53,400
March	65,400	75,700	54,700
April	71,700	96,400	60,500
May	71,500	97,300	49,900
June	56,500	78,000	49,500
July	107,000	152,000	67,000
August	48,900	68,000	37,700
September	54,400	74,000	32,000
Year	66,100	152,000	32,000

TABLE II (Cont'd)

1957-58

MONTH	DAILY DISCHARGE MEAN	MAXIMUM	MINIMUM
October	68,200	88,800	53,400
November	90,600	110,000	72,500
December	93,900	117,000	68,400
January	83,000	98,800	73,900
February	76,700	81,000	73,000
March	84,400	130,000	69,400
April	116,000	138,000	99,200
May	66,300	102,000	53,200
June	58,600	66,300	50,300
July	58,300	69,900	49,400
August	45,700	54,100	37,100
September	53,100	63,100	41,200
Year	74,500	138,000	37,100

TABLE II (Cont'd)

1958-59

MONTH	DAILY DISCHARGE MEAN	MAXIMUM	MINIMUM
October	66,000	82,400	55,200
November	75,600	86,600	69,100
December	66,800	80,600	52,200
January	60,500	74,100	50,700
February	57,200	63,100	50,700
March	52,200	60,100	44,700
April	118,000	157,000	62,100
May	101,000	125,000	68,200
June	58,600	75,500	47,800
July	41,700	48,300	33,600
August	38,200	44,000	30,600
September	46,200	52,000	40,000
Year	65,000	157,000	30,600

TABLE II (Cont'd)

1959-60

MONTH	DAILY DISCHARGE MEAN	MAXIMUM	MINIMUM
October	52,800	69,600	44,700
November	82,500	102,000	65,000
December	84,800	103,000	63,600
January	72,800	81,900	61,100
February	72,100	79,600	66,800
March	68,800	75,000	58,800
April	175,000	230,000	78,000
May	214,000	263,000	144,000
June	83,800	138,000	59,200
July	96,500	130,000	66,200
August	------*	------*	------*
September	------*	------*	------*
	100,700 (10 months only)		

* The removal of Periwig Island and the construction of the Carillon Dam has destroyed the flow-depth relationship and hence flows could no longer be determined at this gauging station.

INTERPRETATION OF ANALYSES

The analyses employed in this investigation to assess the quality of the surface water are as follows:

Biochemical Oxygen Demand (BOD)

The BOD of sewage, polluted waters or industrial wastes is the oxygen required for stabilization (natural purification in a stream) of the decomposable organic matter or chemical material by aerobic biochemical action. Unless otherwise noted, a five-day BOD determination with incubation at 20°C is reported. A high BOD is indicative of organic or chemical pollution. A desirable upper limit in natural water commonly is four (4) parts per million.

Membrane Filter Coliform Count

The membrane filter technique is employed to obtain a direct enumeration of coliform organisms and is reported per 100 millilitres. The presence of coliforms indicates pollution from human or animal excrement, or from some non-faecal forms. A membrane filter coliform count in excess of the desirable upper limit of 2,400 organisms is considered to render the waters undesirable for bathing purposes.

Solids

The analyses for solids include tests for total, suspended, and dissolved solids. The first test measures both the solids in solution and in suspension. The results are reported in parts per million.

The suspended solids indicate the measure of undissolved solids of organic or inorganic nature in suspension. Land erosion, sewage, and industrial wastes are significant sources of suspended solids. The effect of suspended solids in water is reflected in difficulties associated with water purification and deposition in streams which could interfere with navigation and injure the habitat of fish. Where suspended solids values, ascertained by a quantitative analysis, approach 20 parts per million or less, laboratory difficulties usually result in these values being determined as turbidity, a qualitative analysis.

The dissolved solids are a measure of those solids in solution.

Colour

Colour is determined by visual comparison of the sample with known concentrations of coloured solutions. The colour intensity of the water is reported in Apparent Colour Units.

The colouration of natural waters may result from contact with organic matter or chemical substances, which occur naturally or are introduced into the water through waste water discharges.

Phenols

The phenolic compounds, collectively referred to as phenols, are those hydroxy derivatives of benzene or its condensed nuclei, which are determined by the Gibbs Method

with modifications. The results are reported in parts per billion (ppb).

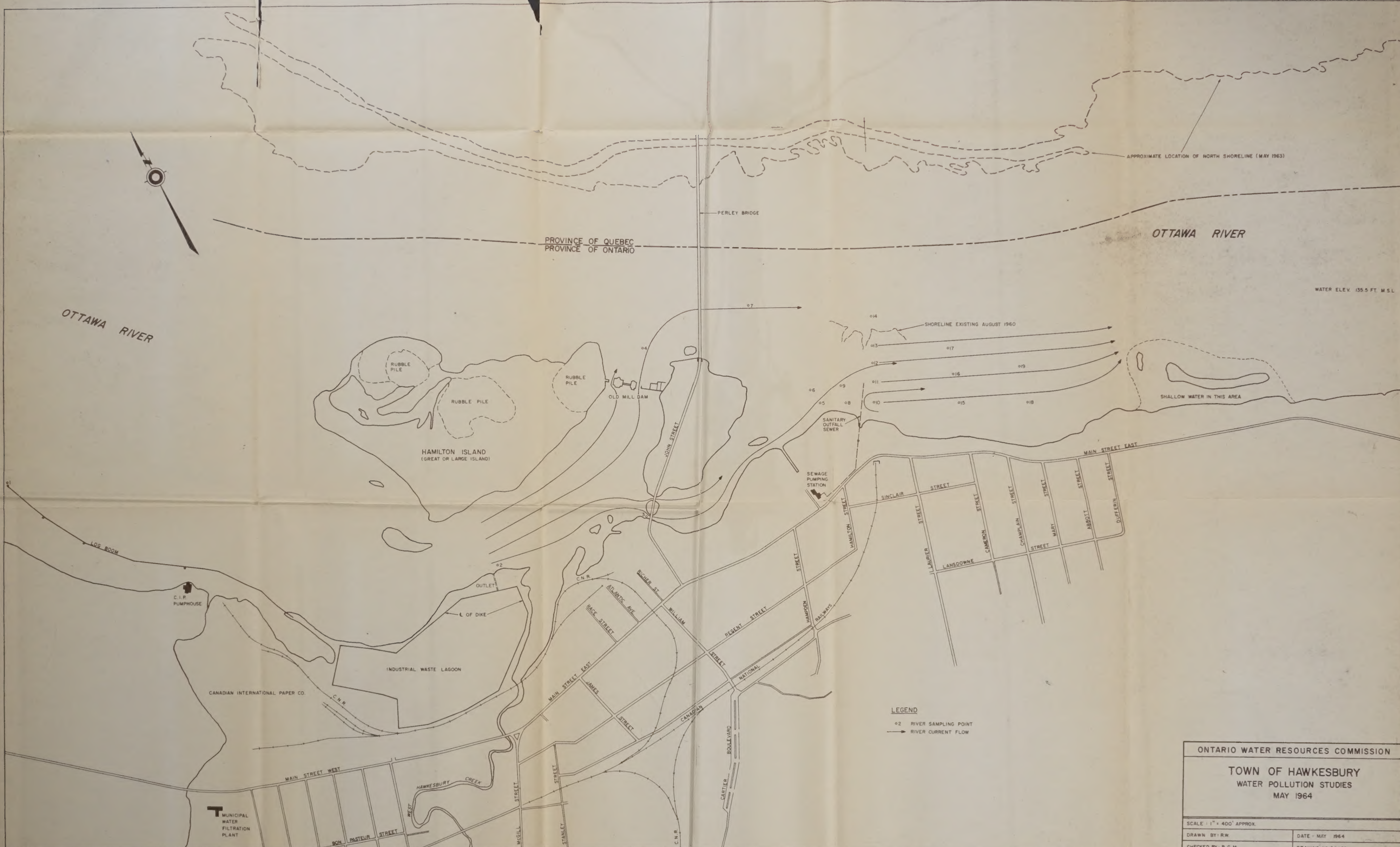
Phenols are present in waste flows from many industrial processes. Dependant on the concentration, the presence of these materials may be toxic to fish or may taint the flesh of fish. Phenols in very minute concentrations will combine with chlorine to produce intense tastes and odours which are variously described as medicinal, chemical or iodoform.

As an objective, the concentration of phenols should not exceed 5 ppb at any point in receiving waters subsequent to initial dilution.

Lignin

Lignin is a plant constituent which is often discharged as a waste during the manufacture of paper pulp. This matter is determined by a colourimetric method and is reported in parts per million as tannic acid.

This test is employed as an indication of the presence of paper mill wastes.



ONTARIO WATER RESOURCES COMMISSION
TOWN OF HAWKESBURY
WATER POLLUTION STUDIES
MAY 1964
SCALE : 1" = 400' APPROX.
DRAWN BY: R.W.
DATE: MAY 1964
CHECKED BY: R.C.M.
DRAWING No 64-39
LEGEND
o2 RIVER SAMPLING POINT
RIVER CURRENT FLOW
OTTAWA RIVER
OTTAWA RIVER
PROVINCE OF QUEBEC
PROVINCE OF ONTARIO
PERLEY BRIDGE
APPROXIMATE LOCATION OF NORTH SHORELINE (MAY 1963)
WATER ELEV. 135.5 FT. M.S.L.
SHORELINE EXISTING AUGUST 1960
SHALLOW WATER IN THIS AREA
RUBBLE PILE
RUBBLE PILE
RUBBLE PILE
RUBBLE PILE
OLD MILL DAM
HAMILTON ISLAND
(GREAT OR LARGE ISLAND)
SANITARY OUTFALL SEWER
SEWAGE PUMPING STATION
LOG BOOM
C.I.P. PUMPHOUSE
OUTLET
℄ OF DIKE
INDUSTRIAL WASTE LAGOON
CANADIAN INTERNATIONAL PAPER CO.
MUNICIPAL WATER FILTRATION PLANT
HAWKESBURY CREEK
MAIN STREET WEST
MAIN STREET EAST
MAIN STREET EAST
BON PASTEUR STREET
WEST
MCGILL STREET
STANLEY STREET
JOHN STREET
RICHER ST.
ATLANTIC AVE.
RACE STREET
JAMES STREET
WILLIAM STREET
REGENT STREET
HAMPDEN STREET
HAMILTON STREET
SINCLAIR STREET
LAURIER STREET
CAMERON STREET
CHAMPLAIN STREET
MARY STREET
ABBOTT STREET
DUFFERIN STREET
LANSDOWNE STREET
CARTIER BOULEVARD
CANADIAN NATIONAL RAILWAYS
C.N.R.
C.N.R.
C.N.R.